

Tropical cyclones and gales.—Subjoined is a report by the Rev. Bernard F. Doucette, S. J., Weather Bureau, Manila, P. I., of two typhoons which affected Philippine waters during May 1938. The typhoon of May 7–18 is noted as having been of hurricane intensity on the 14th. Early that morning the U. S. A. T. *Meigs*, in and near the vicinity of 19°20' N., 129°02' E., encountered winds of force 12 which lasted for several hours. Gales of lower force continued on ship through most of the 14th and even at midnight they had diminished only to force 7.

Fog.—Fog was the most important meteorological element of the month on the North Pacific, particularly in east longitudes, where the conditions of late spring and early summer usually bring it with considerable frequency. In several 5° squares along the western part of the northern steamer routes, and to the west-northwestward of Midway Island on the middle routes, fog occurred on 5 to 6 or more days. The American steamer *President Taft*, eastbound from Yokohama, reported such extensive fog banks east of Honshu on the 4th to longitude 166° E., in latitude 33° N., on the 7th, that a constant lookout had to be kept on account of it. East of midocean, fog was more widely scattered and less frequent. Off the California coast, ships reported fog on the 22d to 25th. During dense fog late on the 23d the American steamer *Walter A. Luckenbach* and the Japanese motorship *Arimasan Maru* collided outside of Los Angeles Harbor breakwater, with the result that much damage was done to both vessels.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, MAY 1938

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Typhoon, April 28–May 5, 1938.—A low-pressure area appeared during the afternoon hours of April 28 about 120 miles east of northern Mindanao and moved, as a depression, along a west-northwesterly course across the Visayan Islands into the China Sea, where, April 30 to May 2, it inclined slightly to the northwest, thus reaching the Paracel Islands. There were no strong winds, nor did the pressure fall very much, and the disturbance seemed to be a depression of little importance.

Intensification began during the afternoon of May 2 as the center changed its course to the north-northeast. Moving more rapidly now, and inclining to the north, the typhoon (there was no doubt that it had intensified to this stage) passed about 100 miles southeast of Hong Kong and entered the China coast close to and west of Swatow shortly before dawn, May 4. It weakened somewhat after this as it was followed for two days, finally disappearing northwest of Shanghai.

The first indications of the strengthening of the storm came with observations received from the S. S. *Tjibadak*. May 3 at 8 a. m. when in latitude 17.3° N., longitude 117.3° E., a pressure of 750.83 mm (29.560 in.) with south-southwest winds, force 6, was reported. From Hong Kong, May 3, at 2 p. m., a pressure of 750.6 mm (29.551 in.) was the lowest of the synoptic observations received.

There are some interesting aspects to be found in a study of the upper winds over these regions as the depression intensified and became a typhoon. The critical period was May 2 and 3, as the depression recurved to the north-northeast and intensified. Indo-China reported only a few ascents before May 1, showing southeast, south, and south-southwest winds with velocities of 10 to 20 k. p. h. below 1,000 m. No pilots were broadcast on May 2. A northeasterly current, less than 20 k. p. h.,

backing to the northwest quadrant in the afternoon, was indicated on May 3. Above 1,500 m, northwest and southwest winds were found, with velocities of 10 to 35 k. p. h. Over Hong Kong, there were east winds, veering aloft to southeast and increasing in strength, from 15 to 50 k. p. h., on May 2, to values over 50 k. p. h. on May 3. On April 29, there were weak east and southeast winds over the Philippines. On the following days, the velocities increased, and from May 1 to 4, velocities from 30 to 60 k. p. h. were maintained. Zamboanga, it should be noted, had northwesterly winds at various levels on May 1 and 2. Over Malaya, westerly and southwesterly winds gradually predominated and increased in strength on April 29 and 30, so that on May 1 to 3, a definite current of air was flowing from the west-southwest and west with velocities from 10 to 30 k. p. h. These data indicate that strengthening winds from the southeast and southwest quadrants had some part in the intensification of the depression.

Typhoon, May 7–18, 1938.—A low pressure area formed over the ocean regions north of Palau, first appearing on May 7. A definite circulation with weak winds around a center and with pressure values slightly below normal, apparently of minor importance, best describes the disturbance, which moved along a westerly course to the Philippines. On May 9 it was central over the Visayan Islands and Luzon. The next day, still a low-pressure area, it was moving in a northwesterly direction with a tendency to incline northward, the center passing along central and northern Luzon. Up to this time, the lowest pressure reported was 753.5 mm (29.665 inches) as the storm moved over the Archipelago.

The morning weather map of May 12 indicated the center about 100 miles east-southeast of Aparri, after passing in a northeasterly direction across northern Luzon into the Pacific, this taking place a short distance north of Palanan, Isabela Pr. During the night, intensification had begun and the storm now manifested the strength of a typhoon. An easterly movement of about 300 miles in 24 hours preceded a change of path to the northeast and then to the north (the afternoon of May 14), the latter change occurring near latitude 20° N., longitude 130° E. On May 16 the center was located not far from latitude 24° N., longitude 130° E., from which position it again moved in a northeasterly direction, gradually inclining to the east-northeast as it disappeared east of northern Japan during the afternoon hours of May 18.

The U. S. A. T. *Meigs*, enroute from Manila to the United States, was traveling along a course almost parallel to that of the typhoon and north of the center. On May 13 and 14, when the typhoon changed its course to the northeast and later to the north, the ship came under the influence of the typhoon winds and seas, encountering heavy seas and winds of hurricane force. Of the many observations sent to the Observatory, that with the lowest barometer reading was made, most likely at noon, May 14 (the time of the observation could not be definitely determined from the radiogram, and verification could not be obtained in time for the preparation of this article), when the ship was in latitude 19° 12' N., longitude 129° 10' E., the value being 29.18 inches (741.17 mm), with south-southwest winds, force 6.

The pilot balloon observations made at Philippine stations during the course of this storm indicate an important factor in the intensification of the disturbance. While the center was over the Archipelago, the circulation was not strong, due very likely to the friction between the air and the land. The southwest quadrant winds at Cebu and Zamboanga were about 15 k. p. h. and at the same time, Manila and Aparri had east and southeast quadrant

winds, velocities from 15 to 30 k. p. h. After May 11, however, when the center was over the ocean regions east of northern Luzon, the circulation was not checked so much by land areas and intensification could be expected. Furthermore, the southwest quadrant winds were allowed to accelerate because of the low hills of southern Luzon, namely the country south of the locality of Infanta, Tayabas Pr. Thus the southwest current of air was allowed to flow more freely and help in the intensification of the storm. The velocities at Cebu and Zamboanga increased threefold during this period, and at Manila, when the winds shifted to the southwest, velocities from 30 to 50 k. p. h. were recorded. Malaya pilots (those which

were copied from the weather broadcasts) on the days preceding May 11 showed east quadrant winds intermingled with southwest quadrant winds, and velocities, with very few exceptions, less than 20 k. p. h. On May 11 and 12, a definite southwest quadrant current prevailed, with velocities from 15 to 25 k. p. h., which, on the following days weakened and had south-southwest and northwest directions intermingled with the southwesterly directions. There is very good evidence in the pilot balloon observations during these days that the topographical features of southern Luzon helped in the intensification by allowing the southwesterly winds to flow more rapidly toward the typhoon center.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—Condensed climatological summary of temperature and precipitation by sections, May 1938

[For description of tables and charts, see REVIEW, January, p. 29]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
Alabama.....	72.9	+1.6	2 stations.....	99	120	Florence.....	42	9	In.	In.	Winfield.....	7.48	Millry.....	0.62
Arizona.....	65.0	-1.0	do.....	114	31	Fort Valley.....	13	7	3.48	-0.64	Fredonia.....	2.36	23 stations.....	.00
Arkansas.....	70.1	+9	Dumas.....	97	130	Thornburg.....	34	9	4.62	-1.13	Eureka Springs.....	15.27	Arkansas City.....	.87
California.....	61.1	-1.3	2 stations.....	113	114	2 stations.....	4	3	4.62	-1.36	Colfax.....	2.52	28 stations.....	.00
Colorado.....	51.9	-3	3 stations.....	95	28	3 stations.....	3	17	2.48	+5.58	Akron.....	5.09	Ignacio.....	.16
Florida.....	76.8	+1.2	Arcadia.....	103	26	2 stations.....	46	15	4.10	+1.12	De Funiak Springs.....	10.38	Clearwater.....	.68
Georgia.....	72.8	+1.2	4 stations.....	102	121	Blairsville.....	38	10	3.47	+1.02	Midville.....	7.86	Alapaha.....	1.13
Idaho.....	51.8	-1.2	3 stations.....	96	26	Warren.....	6	2	1.55	-1.10	Grangeville.....	3.78	Bonnors Ferry.....	.25
Illinois.....	63.0	+3	2 stations.....	92	20	Morris.....	25	13	5.14	+1.07	Edwardsville.....	7.94	Cairo.....	2.71
Indiana.....	62.6	+4	Princeton.....	94	20	Collegeville.....	25	13	5.53	+1.50	Huntingburg.....	9.02	Rochester.....	2.87
Iowa.....	59.5	-5	3 stations.....	89	13	Lake City.....	29	17	5.45	+1.36	Osage.....	11.25	Elkader.....	3.00
Kansas.....	63.5	-3	2 stations.....	99	23	Oberlin.....	26	8	7.56	+3.70	Emporia.....	16.65	Hugoton.....	2.41
Kentucky.....	65.7	+3	Pikeville.....	93	19	Mount Sterling.....	32	13	5.73	+1.71	Owensboro.....	8.46	Grant.....	2.55
Louisiana.....	74.4	+7	2 stations.....	95	129	2 stations.....	44	9	2.51	-2.05	Port Sulphur.....	7.34	Franklinton.....	.54
Maryland-Delaware.....	61.3	-1.1	Cumberland, Md.....	96	4	do.....	23	13	4.34	+9.3	Sines, Md.....	7.60	Snow Hill, Md.....	2.10
Michigan.....	54.8	+8	2 stations.....	90	3	Sidnaw.....	18	12	3.67	+4.49	Centerville.....	8.25	Sault Ste. Marie.....	1.82
Minnesota.....	53.3	-1.8	New Ulm.....	90	2	Roseau.....	48	7	6.55	+3.33	Hastings.....	10.95	Hallock.....	.29
Mississippi.....	73.3	+1.5	Clarksdale.....	100	31	Batesville.....	40	9	2.72	1.61	Fulton.....	12.66	Waynesboro.....	.29
Missouri.....	65.0	+6	Caruthersville.....	94	23	Louisiana.....	32	13	6.13	+1.35	Dean.....	12.21	Dexter.....	2.21
Montana.....	50.6	-1.2	Glasgow.....	92	27	2 stations.....	12	17	3.18	+1.02	Chessman Reservoir.....	7.67	Libby.....	.45
Nebraska.....	53.2	-9	Benkelman.....	97	28	Gordon.....	22	9	4.99	+1.53	Seward.....	9.80	Dalton.....	1.59
Nevada.....	55.4	-1	Las Vegas Airport.....	104	26	Austin.....	12	3	1.18	+1.31	Sharp.....	3.31	Carson City.....	.01
New England.....	53.6	-1.5	Manchester, N. H.....	88	5	3 stations.....	22	14	3.64	+2.39	Kingston, R. I.....	5.84	Gilman, Vt.....	1.59
New Jersey.....	59.0	-1.4	2 stations.....	89	12	2 stations.....	26	113	3.51	-2.22	Woodcliff Lake.....	4.68	Newark.....	2.83
New Mexico.....	58.6	-1.1	Orogrande.....	103	27	Red River Canyon.....	7	8	.67	-5.2	Mosquero.....	4.41	14 stations.....	.00
New York.....	55.0	-9	Dansville.....	89	5	Whiteface Mountain.....	18	12	3.01	-4.5	Skaneateles.....	6.62	Ogdensburg.....	1.24
North Carolina.....	67.7	+9	Fayetteville.....	100	6	Mount Mitchell.....	30	9	4.91	+8.3	Caroleen.....	10.32	Monroe.....	2.14
North Dakota.....	52.0	-1.4	Mott.....	88	28	4 stations.....	18	7	2.55	+2.4	Hillsboro.....	5.42	Pembina.....	1.09
Ohio.....	61.3	+8	3 stations.....	92	13	Medina (near).....	24	12	5.25	+1.55	Miamisburg.....	9.42	Cleveland.....	2.69
Oklahoma.....	68.8	+5	Hollis.....	102	129	Hooker.....	27	8	5.95	+1.22	Fairview.....	13.42	Madill.....	1.59
Oregon.....	53.1	-1	2 stations.....	98	25	Fremont.....	11	15	.84	-88	Headworks.....	3.68	3 stations.....	T
Pennsylvania.....	58.8	-7	Sharon.....	93	5	Coudersport.....	20	11	3.85	-1.02	Rochester.....	6.56	Gratersford.....	1.53
South Carolina.....	72.3	+1.4	Lake City.....	102	22	Long Creek (near).....	39	10	4.14	+56	Spartanburg.....	7.46	Heath Springs.....	1.62
South Dakota.....	55.2	-1.1	Hot Springs.....	94	28	Redig.....	18	7	3.48	+60	Forestburg.....	6.00	McLaughlin.....	1.74
Tennessee.....	67.8	+9	2 stations.....	93	19	Elkmont.....	35	16	5.51	+1.62	Tellico Plains.....	9.60	Memphis.....	2.86
Texas.....	73.5	+5	Fort Stockton.....	109	27	Muleshoe.....	27	8	3.08	-56	Houston.....	10.27	2 stations.....	.00
Utah.....	53.3	-2.0	2 stations.....	100	14	Silver Lake.....	5	5	1.80	+58	Silver Lake.....	5.15	La Sal.....	.04
Virginia.....	63.7	-4	Danville.....	96	4	2 stations.....	30	12	4.31	+57	Pennington Gap.....	7.39	Balcony Falls.....	2.04
Washington.....	55.3	+7	3 stations.....	98	124	Paradise Inn.....	19	1	1.09	-87	Palmer.....	6.02	White Swan.....	.00
West Virginia.....	61.1	-6	Glenville.....	94	5	Bayard.....	20	13	5.97	+2.01	Glenville.....	10.51	Inwood.....	3.62
Wisconsin.....	55.1	-1	Brodhead.....	89	2	Long Lake.....	18	12	5.06	+1.46	River Falls.....	11.89	Plymouth.....	1.41
Wyoming.....	48.4	-1.0	5 stations.....	90	127	Dome Lake.....	3	7	2.63	+55	Sheridan Field Station.....	7.11	Kemmerer.....	.79
Alaska (April).....	34.5	+7.9	Seclusion Harbor.....	70	23	Allakaket.....	-15	120	1.67	+22	Ketchikan.....	15.20	Barrow.....	.00
Hawaii.....	71.9	+2	Kaanapali.....	92	1	Kanalohulu.....	42	18	10.09	+4.31	Puonakamoa No. 2.....	55.00	Waimea.....	.00
Puerto Rico.....	76.5	-7	2 stations.....	95	113	Garzas.....	55	28	5.61	-1.72	Maricao.....	24.20	Juana Diaz.....	.21

Other dates also.